Climate change beliefs and savings behavior: a macroeconomic perspective

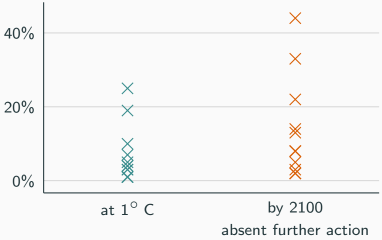
Hannah Römer

November 7, 2025

University of Oxford

Climate change matters: for economy

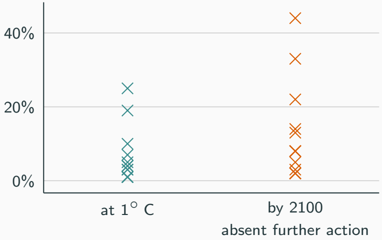
Estimated impacts of climate change
as percentage of GDP



collected by Aerts et al (2024)
calculations based on leading damage functions

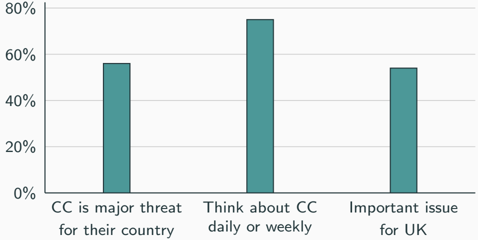
Climate change matters: for economy and population

Estimated impacts of climate change
as percentage of GDP



collected by Aerts et al (2024)
calculations based on leading damage functions

Public opinions on climate change



Shares of respondents.
Data from Pew Research (2022, 19 countries),
Peoples Climate Vote (2024, 50 countries),
ONS (2025, UK)

Motivation: beliefs over climate change impacts

Climate change is a major challenge of our time.
But: Highly uncertain $\rightarrow$ subjective, diverse beliefs

Limited scope for individual actions against climate change: savings?

+ Self-insurance
– Decreasing returns, stranded assets

Motivation: beliefs over climate change impacts

Climate change is a major challenge of our time.
But: Highly uncertain $\rightarrow$ subjective, diverse beliefs

Limited scope for individual actions against climate change: savings?

+ Self-insurance
− Decreasing returns, stranded assets

What are the macroeconomic implications of climate change beliefs?

Motivation: beliefs over climate change impacts

Climate change is a major challenge of our time.
But: Highly uncertain $\rightarrow$ subjective, diverse beliefs

Limited scope for individual actions against climate change: savings?

+ Self-insurance
– Decreasing returns, stranded assets

What are the macroeconomic implications of climate change beliefs?

- Do beliefs over climate change affect individual savings?
- Does the effect on capital accumulation have macroeconomic consequences? Today, in the future?
- Does disagreement over climate impacts matter?

This paper: individual choices and aggregate effects

Do climate beliefs affect individual savings?

Do climate beliefs matter for macroeconomic outcomes via capital accumulation?

This paper: individual choices and aggregate effects

Do climate beliefs affect individual savings?

- Theoretical predictions from analytical model
- Empirical UK survey evidence: observational (representative panel), causal (online questionnaire)

Do climate beliefs matter for macroeconomic outcomes via capital accumulation?

This paper: individual choices and aggregate effects

Do climate beliefs affect individual savings?

- Theoretical predictions from analytical model
- Empirical UK survey evidence: observational (representative panel), causal (online questionnaire)

Do climate beliefs matter for macroeconomic outcomes via capital accumulation?

- Non-stationary general equilibrium model with incomplete markets and aggregate risk
  - Climate change as shift in stochastic productivity process
  - Uncertainty over trend in productivity
  - Heterogeneity in income, wealth and beliefs

Key take-aways: climate change beliefs matter.

Climate beliefs increase individual savings both in theory and empirically...

...and affect macroeconomic outcomes during the climate transition.

Key take-aways: climate change beliefs matter.

Climate beliefs increase individual savings both in theory and empirically...

- Significant positive relationship between climate change beliefs and savings choices: Likelihood to save +9pp, savings share +1pp, MPS +7.6%
- Consistent with theoretical predictions when income effects dominate

...and affect macroeconomic outcomes during the climate transition.

Key take-aways: climate change beliefs matter.

Climate beliefs increase individual savings both in theory and empirically...

- Significant positive relationship between climate change beliefs and savings choices: Likelihood to save +9pp, savings share +1pp, MPS +7.6%
- Consistent with theoretical predictions when income effects dominate

...and affect macroeconomic outcomes during the climate transition.

- Climate concern effect: capital $\uparrow$ output loss from climate change $\downarrow$ NPV of output: -12% under optimistic versus accurate beliefs
- Higher capital benefits the poor disproportionally: wealth inequality $\downarrow$ Gini: -0.2% during transition relative to initial value
- Small but persistent impacts of disagreement: NPV of output: -1.5% under dispersed relative to homogenous beliefs

Literature and contributions

Climate change impacts on the macroeconomy

- Stochastic damages: Golosov et al. (2014), Cai and Lontzek (2019)
- Anticipation: Bilal and Rossi-Hansberg (2023), Bakkensen and Barrage (2022)

Contribution: Amplified consequences of climate uncertainty in decentralized framework

Literature and contributions

Climate change impacts on the macroeconomy

- Stochastic damages: Golosov et al. (2014), Cai and Lontzek (2019)
- Anticipation: Bilal and Rossi-Hansberg (2023), Bakkensen and Barrage (2022)

Contribution: Amplified consequences of climate uncertainty in decentralized framework

Beliefs and disagreement over aggregate (climate) process

- Hong et al. (2023), Bakkensen et al. (2023), Chen et al. (2012), Lontzek et al. (2024)

Contribution: Implications along the transition

Literature and contributions

Climate change impacts on the macroeconomy

- Stochastic damages: Golosov et al. (2014), Cai and Lontzek (2019)
- Anticipation: Bilal and Rossi-Hansberg (2023), Bakkensen and Barrage (2022)

Contribution: Amplified consequences of climate uncertainty in decentralized framework

Beliefs and disagreement over aggregate (climate) process

- Hong et al. (2023), Bakkensen et al. (2023), Chen et al. (2012), Lontzek et al. (2024)

Contribution: Implications along the transition

Incomplete markets and aggregate risks: theory and computation

- Krusell and Smith (1998), Farhi et al. (2022), Broer et al. (2022), Fernández-Villaverde et al. (2023), Bilal (2023), Auclert et al. (2021), Moll (2024)

Contribution: Non-stationarity in aggregate process, global solution method

Predictions in partial equilibrium

Savings response to a change in climate change beliefs

Consumers allocate resources intertemporally to maximize expected life-time utility, subject to budget constraint and borrowing limit.

Savings response to a change in climate change beliefs

Consumers allocate resources intertemporally to maximize expected life-time utility, subject to budget constraint and borrowing limit.

Two types of uncertainty affect income:

- Aggregate state: dependent on climate change
  - ➢ Productivity: pins down average wages and asset returns
  - ➢ Two possible states: low and high
- Idiosyncratic state: independent of climate change
  - ➢ Demographics: affects labor income

Model details

Savings response to a change in climate change beliefs

Consumers allocate resources intertemporally to maximize expected life-time utility, subject to budget constraint and borrowing limit.

Two types of uncertainty affect income:

- Aggregate state: dependent on climate change
  - ➢ Productivity: pins down average wages and asset returns
  - ➢ Two possible states: low and high
- Idiosyncratic state: independent of climate change
  - ➢ Demographics: affects labor income

Model details

How do savings depend on beliefs over climate change?

➤ How do intertemporal choices respond to changes in probabilities of aggregate states?

➤ First order response to perturbation in probability from Euler equation (cf. Farhi et al., 2022)

First order consumption response

An increase in $p' = \mathbb{P}(\text{low productivity next period})$ affects consumption choice today:

$$\frac{d \ln(c)}{dp'} = -\varepsilon(c) \cdot MPS \cdot \mathcal{D}.$$

First order consumption response

An increase in $p' = \mathbb{P}(\text{low productivity next period})$ affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\varepsilon(c) \cdot MPS \cdot \mathcal{D}\,.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  - $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  - $\rightarrow$ Amplified by incomplete markets

First order consumption response

An increase in $p' = \mathbb{P}(\text{low productivity next period})$ affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\varepsilon(c) \cdot \boxed{MPS} \cdot \mathcal{D}.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  $\rightarrow$ Amplified by incomplete markets

- MPS: Marginal propensity to save

First order consumption response

An increase in $p' = \mathbb{P}(\text{low productivity next period})$ affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\,\varepsilon(c) \cdot MPS \cdot \mathcal{D}\,.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  $\rightarrow$ Amplified by incomplete markets

- MPS: Marginal propensity to save

- $\varepsilon(c)$: Elasticity of intertemporal substitution

First order consumption response

An increase in $p' = \mathbb{P}(\text{low productivity next period})$ affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\varepsilon(c) \cdot MPS \cdot \mathcal{D}.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  - $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  - $\rightarrow$ Amplified by incomplete markets
  - $\rightarrow$ High for low asset holding, low expected income
- MPS: Marginal propensity to save
  - $\rightarrow$ Small if borrowing constrained
- $\varepsilon(c)$: Elasticity of intertemporal substitution

First order consumption response

An increase in $p' = \mathbb{P}(\text{low productivity next period})$ affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\varepsilon(c) \cdot MPS \cdot \mathcal{D}.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  - $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  - $\rightarrow$ Amplified by incomplete markets
  - $\rightarrow$ High for low asset holding, low expected income
- MPS: Marginal propensity to save
  - $\rightarrow$ Small if borrowing constrained
- $\varepsilon(c)$: Elasticity of intertemporal substitution
- Future impacts: history dependence, risk-adjusted measure

Details

First order consumption response

An increase in $p' = \mathbb{P}$(low productivity next period) affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\varepsilon(c) \cdot MPS \cdot \mathcal{D}.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  - $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  - $\rightarrow$ Amplified by incomplete markets
  - $\rightarrow$ High for low asset holding, low expected income
- MPS: Marginal propensity to save
  - $\rightarrow$ Small if borrowing constrained
- $\varepsilon(c)$: Elasticity of intertemporal substitution
- Future impacts: history dependence, risk-adjusted measure

Details

Take-aways:

1. Concern over adverse macro risks: individual savings $\uparrow$ in standard model

First order consumption response

An increase in $p' = \mathbb{P}$(low productivity next period) affects consumption choice today:

$$\frac{d\ln(c)}{dp'} = -\varepsilon(c) \cdot MPS \cdot \mathcal{D}.$$

- $\mathcal{D}$: Relative effect of low draw on expected marginal value of wealth
  - $\rightarrow$ For CRRA utility ≥ 0 if $EIS < 1$
  - $\rightarrow$ Amplified by incomplete markets
  - $\rightarrow$ High for low asset holding, low expected income
- MPS: Marginal propensity to save
  - $\rightarrow$ Small if borrowing constrained
- $\varepsilon(c)$: Elasticity of intertemporal substitution
- Future impacts: history dependence, risk-adjusted measure

Details

Take-aways:

1. Concern over adverse macro risks: individual savings $\uparrow$ in standard model
2. Opposing forces of current idiosyncratic state: large effect for poor savers

Empirical evidence

Empirical support for theoretical predictions

Model predictions:

- Climate change concern increases savings
- Heterogeneity across population

Empirical support for theoretical predictions

Model predictions:

- ➤ Climate change concern increases savings
- ➤ Heterogeneity across population

Test these predictions in the data

- Measure of climate change concern matched with savings choices
- Controls for demographics, in particular income
- Challenge: unobserved characteristics, e.g. preferences

Empirical support for theoretical predictions

Model predictions:

- Climate change concern increases savings
- Heterogeneity across population

Test these predictions in the data

- Measure of climate change concern matched with savings choices
- Controls for demographics, in particular income
- Challenge: unobserved characteristics, e.g. preferences

Two types of UK survey evidence:

1. Observational: large, representative UK panel survey
2. Causal: specific purpose online questionnaire

Observational data

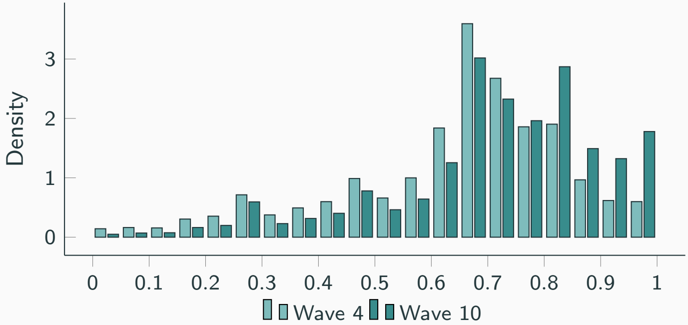
UK Longitudinal Household Survey, waves 4 and 10 (2012-13, 2018-19)

- Construct index about climate change concern

Climate concern index

Five questions on beliefs over climate change, e.g.

- People in the UK will be affected by climate change in the next 30 years.
- If things continue on their current course, we will soon experience a major environmental disaster.



mean = 0.72 standard deviation = 0.22 autocorrelation = 0.53

Observational data

UK Longitudinal Household Survey, waves 4 and 10 (2012-13, 2018-19)

- Construct index about climate change concern
- Savings variables (binary and amount)
- Demographic indicators
  - education, income, age, children, residence, flood exposure (matched)

Observational data

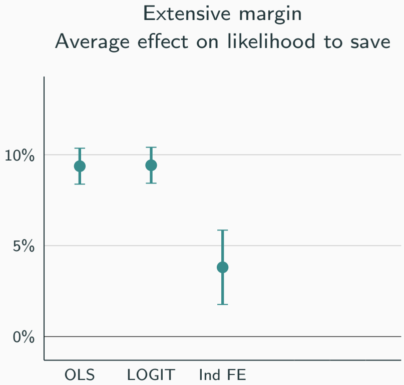
UK Longitudinal Household Survey, waves 4 and 10 (2012-13, 2018-19)

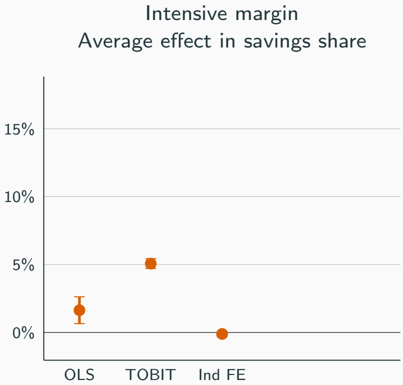
- Construct index about climate change concern
- Savings variables (binary and amount)
- Demographic indicators
  - education, income, age, children, residence, flood exposure (matched)

Addresses two main concerns:

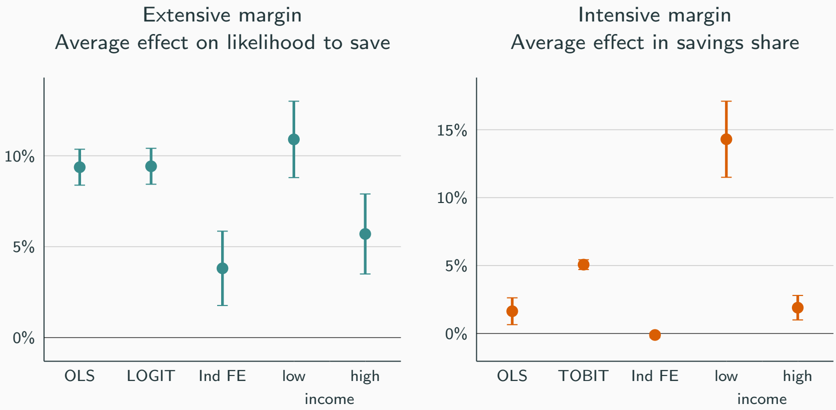
1. Preferences over risk and time $\rightarrow$ Individual fixed effects
2. Idiosyncratic exposure $\rightarrow$ Flood exposure, area fixed effects

Empirical results: full versus no concern





Empirical results: full versus no concern



Specific purpose online survey

Goal: obtain causal evidence by using within-subject design (cf. Andre et al., 2025)

Specific purpose online survey

Goal: obtain causal evidence by using within-subject design (cf. Andre et al., 2025)

Hypothetical savings choice: How much would you save out of a 5000 GBP transfer?

- For each of 2 different climate impact scenarios: Increasing $\mathcal{I}$, Constant $\mathcal{C}$
- Presented in random order

Specific purpose online survey

Goal: obtain causal evidence by using within-subject design (cf. Andre et al., 2025)

Hypothetical savings choice: How much would you save out of a 5000 GBP transfer?

- For each of 2 different climate impact scenarios: Increasing $\mathcal{I}$, Constant $\mathcal{C}$
- Presented in random order

Key statistic: relative effect of scenario on marginal savings

$$\Delta s = \frac{\text{Saved}\,|\mathcal{I} - \text{Saved}\,|\mathcal{C}}{\text{Saved}\,|\mathcal{C}}$$

Specific purpose online survey

Goal: obtain causal evidence by using within-subject design (cf. Andre et al., 2025)

Hypothetical savings choice: How much would you save out of a 5000 GBP transfer?

- For each of 2 different climate impact scenarios: Increasing $\mathcal{I}$, Constant $\mathcal{C}$
- Presented in random order

Key statistic: relative effect of scenario on marginal savings

$$\Delta s = \frac{\text{Saved } |\mathcal{I} - \text{Saved } |\mathcal{C}}{\text{Saved } |\mathcal{C}}$$

	Full sample
Δs	7.6%***
Observations	543

Income		
low	medium	high
10.0%***	7.2%**	5.3%
178	230	81

Survey design Sample Questionnaire

Take-aways and open questions

Key take-aways:

- Passthrough of adverse aggregate risks: savings $\uparrow$ depending on idiosyncratic state
- Empirical evidence: positive relationship between climate concern and savings choices

Take-aways and open questions

Key take-aways:

- Passthrough of adverse aggregate risks: savings $\uparrow$ depending on idiosyncratic state
- Empirical evidence: positive relationship between climate concern and savings choices

Open question: Do climate change beliefs matter for the macroeconomy?

- How does additional capital accumulation affect output losses during climate transition?
- Does the observed disagreement over climate change matter for macroeconomic outcomes?

$\rightarrow$ Dynamic general equilibrium model

Dynamic general equilibrium model

General equilibrium model: endogenous prices

Households

- are subject to idiosyncratic shocks: income and life-cycle;
- consume and save to maximize EU, given budget constraint and borrowing limit.

Representative firm

- produces using capital and labor;
- pays wages and interest;
- is subject to productivity shocks $\zeta_t \in \{\zeta^L, \zeta^H\}$, $\zeta^L < \zeta^H$.

Market clearing

- implies aggregate capital equals households' asset holdings.

General equilibrium model: endogenous prices

Households

- are subject to idiosyncratic shocks: income and life-cycle;
- consume and save to maximize EU, given budget constraint and borrowing limit.

Representative firm

- produces using capital and labor;
- pays wages and interest;
- is subject to productivity shocks $\zeta_t \in \{\zeta^L, \zeta^H\}$, $\zeta^L < \zeta^H$.

Market clearing

- implies aggregate capital equals households' asset holdings.

Climate change

- causes exogenous and deterministic increase in global temperature T_t;
- which is known at time $t = 0$ and may affect the frequency of low productivity states.

$\rightarrow$ Non-stationarity

Climate change impacts

Probability of adverse aggregate shock is given by $\mathbb{P}(\zeta_t = \zeta^L) = p^{1-\gamma T_t}$ with unknown parameter γ

- Two possible states of the world: $\gamma \in \{0, \overline{\gamma}\}$
- Individual initial belief $\pi_{it} = \mathbb{P}_{i0}(\gamma = \overline{\gamma})$
- Bayesian updating

Climate change impacts

Probability of adverse aggregate shock is given by $\mathbb{P}(\zeta_t = \zeta^L) = p^{1-\gamma T_t}$ with unknown parameter γ

- Two possible states of the world: $\gamma \in \{0, \overline{\gamma}\}$
- Individual initial belief $\pi_{it} = \mathbb{P}_{i0}(\gamma = \overline{\gamma})$
- Bayesian updating

Impacts modeled via probability, levels stay constant

- Any draw $\{\zeta_t\}_t$ possible under all beliefs
- Implicit level effect

Consumer problem

Aggregate capital is both endogenous outcome and input for decision of forward looking consumer.

Consumer problem

Aggregate capital is both endogenous outcome and input for decision of forward looking consumer.

Assumption: bounded rationality

Decisions are based on Perceived Law of Motion (PLM)

$$K' = \mathcal{H}(K; \mathcal{X}) \quad \text{for some explanatory variables } \mathcal{X}.$$

Aggregate capital is both endogenous outcome and input for decision of forward looking consumer.

Assumption: bounded rationality

Decisions are based on Perceived Law of Motion (PLM)

$$K' = \mathcal{H}(K; \mathcal{X}) \quad \text{for some explanatory variables } \mathcal{X}.$$

How to choose PLM?

1. Find self-justified equilibrium to approximate rational expectations (Krusell and Smith, 1998)
   $\rightarrow$ extend idea to non-stationary framework
2. Alternative: adaptive expectations with varying degree of memory dependence
   $\rightarrow$ addresses critique by Moll (2024)

Equilibrium and comparative statics

For period t: Ψ_t distribution of agents over demographics, asset holdings and beliefs.

Dynamic equilibrium

For a given draw $\{\zeta_t\}_t$, initial distribution Ψ_0 and PLM $\mathcal{H}$, the *dynamic equilibrium* of the economy is given by a sequence of distributions $\{\Psi_t\}_{t\geq 0}$ so that:

1. Each period, households and firms optimize given their beliefs; markets clear.
2. Ψ_t evolves according to (i) demographic dynamics, (ii) savings choices, and (iii) Bayes' formula.

Equilibrium and comparative statics

For period t: Ψ_t distribution of agents over demographics, asset holdings and beliefs.

Dynamic equilibrium

For a given draw $\{\zeta_t\}_t$, initial distribution Ψ_0 and PLM $\mathcal{H}$, the *dynamic equilibrium* of the economy is given by a sequence of distributions $\{\Psi_t\}_{t\geq 0}$ so that:

1. Each period, households and firms optimize given their beliefs; markets clear.
2. Ψ_t evolves according to (i) demographic dynamics, (ii) savings choices, and (iii) Bayes' formula.

Summary statistics

- Stochastic steady state
- Ensemble averages

Solution algorithm: PLM estimation

Fix some functional form

- Obvious candidates for $\mathcal{X}$: shock ζ, temperature T, personal belief π
- Guess for $\mathcal{H}$
  - linear in $\pi \rightarrow$ estimate only for $\pi \in \{0, 1\}$

Solution algorithm: PLM estimation

Fix some functional form

- Obvious candidates for $\mathcal{X}$: shock ζ, temperature T, personal belief π
- Guess for $\mathcal{H}$
  - linear in $\pi \to$ estimate only for $\pi \in \{0, 1\}$

Generate simulated data

- Non-stationarity: ensemble of shock sequences
  - Stratified sample: Match theoretical mean and variance within each period

Iterate on parameters until convergence.

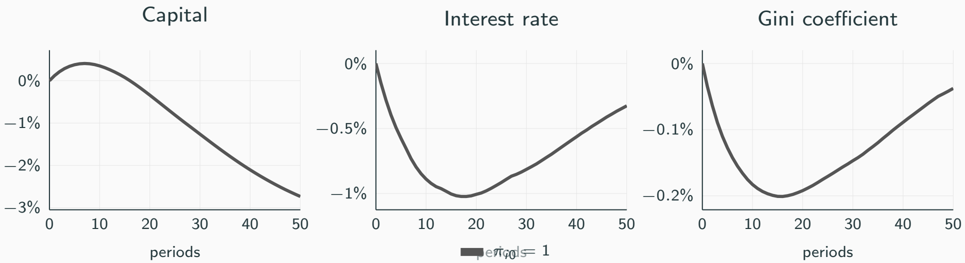
Stratification procedure | Model selection | Adaptive expectations with memory
Model performance | Heterogeneity in forecasts
Calibration

Macroeconomic effects of climate beliefs

The climate transition

Baseline: $\overline{\gamma} = \gamma$

How does the climate transition affect the macroeconomy if everyone expects productivity impacts?



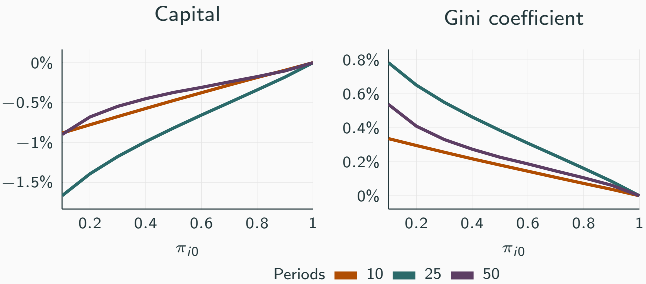
Ensemble averages over time, relative to initial SSS

The role of beliefs during the climate transition

Capital $\downarrow$ if population assumes 50% chance of no productivity impacts
$\rightarrow$ wealth inequality rises

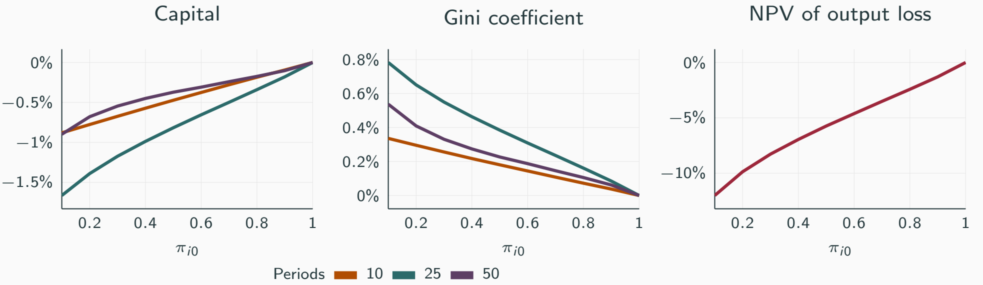
Ensemble averages over time, relative to initial SSS

The role of beliefs during the climate transition



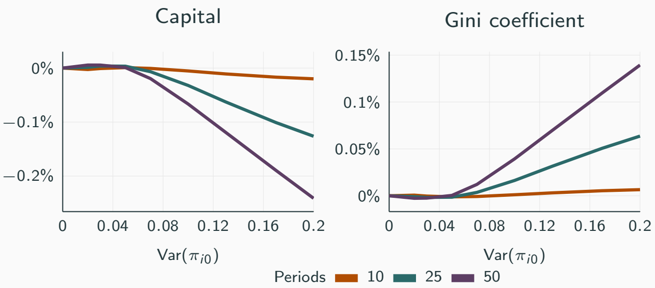
Relative deviation to $\pi_{i0} = 1$, no belief heterogeneity

The role of beliefs during the climate transition



Relative deviation to $\pi_{i0} = 1$, no belief heterogeneity

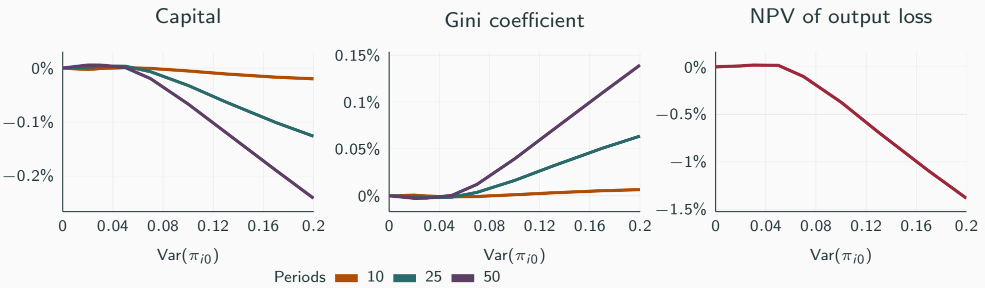
The effects of belief dispersion



Relative deviation to $\text{Var}(\pi_{i0}) = 0$ at $\mathbb{E}(\pi_{i0}) = 0.7$.

- Capital $\downarrow$ Gini $\uparrow$ under mean-preserving spread
- Persistent: devation rises even after 25 years
- Small effects compared to variation in first moment

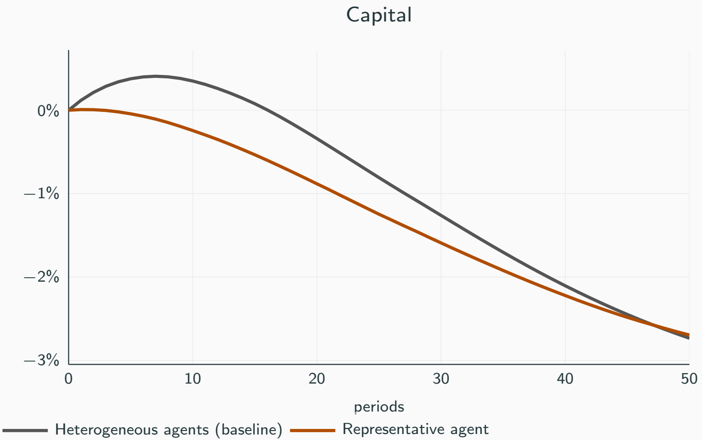
The effects of belief dispersion



Relative deviation to $\text{Var}(\pi_{i0}) = 0$ at $\mathbb{E}(\pi_{i0}) = 0.7$.

- Capital $\downarrow$ Gini $\uparrow$ under mean-preserving spread
- Persistent: devation rises even after 25 years
- Small effects compared to variation in first moment

Mechanisms: the role of incomplete markets



Relative deviation to initial SSS

Additional results and robustness

Additional results

- Climate change deniers $\pi_{i0} = 0 \rightarrow$ endogenous polarization
- Alternative true model $\gamma \rightarrow$ asymmetric effects
- Welfare analysis $\rightarrow$ gains for future generations

Robustness

- Alternative PLM: memory matters

Beliefs over climate change matter.

Individual behavior

- Climate concern increases individual savings in model of aggregate climate damages
- Consistent with UK survey evidence

Aggregate and distributional effects

- Climate concern effect: capital increases in short-run, attenuates climate damages
- Heterogeneous impacts: wealth inequality $\downarrow$
- Disagreement: small but persistent role

Beliefs over aggregate risks in incomplete markets

- Development and solution of non-stationary model
- Applicable to range of questions on uncertainty and disagreement over structural shifts

References

Andre, P., Flynn, J. P., Nikolakoudis, G. and Sastry, K. (2025), ‘Quick-fixing: Near-rationality in consumption and savings behavior’, *NBER Working Paper Series* .

Auclert, A., Bardóczy, B., Rognlie, M. and Straub, L. (2021), ‘Using the sequence-space jacobian to solve and estimate heterogeneous-agent models’, *Econometrica* **89**, 2375–2408.

Bakkensen, L. A. and Barrage, L. (2022), ‘Going underwater? flood risk belief heterogeneity and coastal home price dynamics’, *The Review of Financial Studies* **35**, 3666–3709.
URL: *https://doi.org/10.1093/rfs/hhab122*

Bakkensen, L., Phan, T. and Wong, T.-N. (2023), ‘Leveraging the disagreement on climate change: Theory and evidence’, *Federal Reserve Bank of Richmond Working Papers* **23**, 1–75.

Bilal, A. (2023), ‘Solving heterogeneous agent models with the master equation’, *NBER Working Paper Series* .

Bilal, A. and Känzig, D. (2024), *The Macroeconomic Impact of Climate Change: Global vs. Local Temperature*, National Bureau of Economic Research.

Bilal, A. and Rossi-Hansberg, E. (2023), Anticipating climate change across the united states, Technical report, National Bureau of Economic Research.
URL: *http://www.nber.org/papers/w31323*

Broer, T., Kohlhas, A., Mitman, K. and Schlafmann, K. (2022), 'Expectation and wealth heterogeneity in the macroeconomy', *CEPR Discussion Paper* .

Burke, M., Hsiang, S. M. and Miguel, E. (2015), 'Global non-linear effect of temperature on economic production', *Nature (London)* **527**, 235–239.

Cai, Y. and Lontzek, T. S. (2019), 'The social cost of carbon with economic and climate risks', *Journal of Political Economy* **127**, 2684–2734.

Chen, H., Joslin, S. and Tran, N.-K. (2012), 'Rare disasters and risk sharing with heterogeneous beliefs', *The Review of Financial Studies* **25**, 2189–2224.
URL: *https://doi.org/10.1093/rfs/hhs064*

Farhi, E., Olivi, H. A. and Werning, I. (2022), Price theory for incomplete markets *, Technical report.

Fernández-Villaverde, J., Hurtado, S. and Nuño, G. (2023), 'Financial frictions and the wealth distribution', *Econometrica* **91**, 869–901.

Golosov, M., Hassler, J., Krusell, P. and Tsyvinski, A. (2014), 'Optimal taxes on fossil fuel in general equilibrium', *Econometrica* **82**, 41–88.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA10217*

Hong, H., Wang, N. and Yang, J. (2023), 'Mitigating disaster risks in the age of climate change', *Econometrica* **91**, 1763–1802.

Krusell, P. and Smith, A. A. J. (1998), 'Income and wealth heterogeneity in the macroeconomy', *Journal of Political Economy* **106**, 867–896.
URL: *http://www.jstor.org/stable/10.1086/250034*

Lontzek, T., Pohl, W., Schmedders, K., Thalhammer, M., Wilms, O., Allard, A.-F., Bansal, R., Branger, N., Fama, E., Fabisik, K., Gao, C., Hansen, L. P., Judd, K. L., Koijen, R., Nagel, S., Pflueger, C., Pouget, S., Rossi-Hansberg, E., Schneider, C. and Whelan, P. (2024), Asset pricing with disagreement about climate risks *, Technical report.

Moll, B. (2024), The trouble with rational expectations in heterogeneous agent models: A challenge for macroeconomics.

Rising, J., Dietz, S., Dumas, M., Khurana, R., Kikstra, J., Lenton, T., Linsenmeier, M., Smith, C., Taylor, C. and Ward, B. (2022), What will climate change cost the uk? risks, impacts and mitigation for the net-zero transition, Technical report, Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science.

Calibration

Earnings and life-cycle:

- AR(1) process for skills estimated on UK panel data
- Expected duration working life (retirement): 40 (20) years; replacement rate 60%

Aggregate shocks: Effect of climate change on UK productivity

- AR(1) process for temperature, long-run increase of 0.9 deg within 75 years.
- Meta study Rising et al. (2022) estimates output losses:

$$1.1\% \text{ in } 2022,\ 3.3\% \text{ by } 2050,\ 7.4\% \text{ by } 2100$$

- Bad states $p_0 = 0.15$, $\zeta^L = 0.93$:

$$\mathbb{E}(\zeta_0) = 0.9895,\ \mathbb{E}(\zeta_{100}) = 0.965$$